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ADDENDUM TO FINAL  
FEASIBILITY STUDY REPORT

REQUIRED MINIMUM COVER THICKNESS  
TO REMEDIATE AIRBORNE CONTAMINATION AT THE  
JOHNS-MANVILLE WAUKEGAN, ILLINOIS  
DISPOSAL SITE

JANUARY 28, 1987

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## 1.0 BACKGROUND

The Manville Sales Corporation (Manville), formerly the Johns-Manville Sales Corporation, operates a manufacturing waste disposal area adjacent to its Waukegan, Illinois manufacturing plant. Manville has disposed of various manufacturing wastes, including asbestos-containing wastes and waste materials containing trace amounts of lead, chromic oxide, thiram, and xylene, in the disposal area since about 1922.

## 2.0 APPLICABILITY

The remedial alternative recommended by Manville includes a ground water monitoring program and cover designs for dry disposal areas, roadways, dikes, and levees adjacent to settling basins. This addendum considers only the required and proposed soil cover designs for the dry disposal areas of the Johns-Manville site; all other proposed cover designs and the ground water monitoring program are deemed acceptable as presented in the Final Feasibility Study (FS) Report. The dry disposal areas to which the required cover thickness applies include all inactive waste piles and the asbestos disposal pit, which will be closed as part of the recommended alternative; the shaded areas on Figure 1 represent the specific site areas to which this addendum applies.

## 3.0 HEALTH EFFECTS

### 3.1 Volume and Nature of Wastes

Since about 1922, hundreds of thousands of tons of industrial waste containing asbestos have been disposed of at the Waukegan site by Manville. These wastes are primarily residues containing roofing and insulating materials and cuttings and waste products from the manufacture of asbestos cement pipe. Through erosion or incomplete burial, many deposits are presently exposed to the atmosphere or lie less than a foot below the surface. The asbestos in these waste materials is in the encapsulated or bound form; however, upon exposure to ground water and particularly to rain, sunlight, air, and wind, the cementing or binding agents break down and allow the asbestos fibers to become readily releasable to the air. The site has also received friable (easily crumbled and readily releasable to the air) asbestos wastes since 1922.

### 3.2 Remedial Investigation Results

Studies undertaken as part of the Remedial Investigation (RI) for the site indicate that elevated air levels of asbestos fibers exist on-site. Due to the health hazards associated with asbestos and the fact that lead and particulate air levels attributed to the site were within applicable Federal standards, asbestos is the primary contaminant of concern at the site from an air pollution standpoint and is the contaminant around which all Manville cover proposals and the required cover thickness in this addendum are designed.

### 3.3 Asbestos Health Effects

The medical hazard from asbestos arises when the product becomes friable, or readily releasable to the air. Both friable asbestos and bound or encapsulated asbestos were deposited at the Johns-Manville disposal area. Over time, the bound asbestos can be separated from the binder and become readily releasable to the air.

Asbestos fibers are much smaller and more buoyant than ordinary dust particles and float almost indefinitely in the air, where they can be easily inhaled or swallowed. Inhalation of asbestos fibers can cause a number of serious diseases, including asbestosis, a chronic disease of the lungs which makes breathing increasingly difficult and may cause death, lung cancer, and mesothelioma, a cancer of the membranes that line the chest and abdomen which is always fatal.

Once asbestos enters the body, it remains there indefinitely. It can move from the lungs to other parts of the body, including the digestive tract, brain, and sex organs. Cancers can occur from 15 to 40 years after the first exposure. No safe limit of exposure is known, and any exposure to asbestos carries some health risk. Additionally, anyone exposed to asbestos who also smokes cigarettes has five times the chance of contracting lung cancer than a cigarette smoker who has not been exposed to asbestos.

Studies have shown that industrial workers, their families, and other persons living or working near asbestos manufacturing operations are endangered. Those exposed to asbestos fibers have been found to have five times the chance of developing an asbestos-related disease as does the general population.

## 4.0 APPLICABLE REGULATIONS - ASBESTOS AIR CONTAMINATION

### 4.1 Federal

The National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements for inactive waste disposal sites for asbestos mills and manufacturing and fabrication operations, located at 40 CFR § 61.153, apply to the soil cover alternatives selected for this site. NESHAP requires either no visible emissions or one of the following, to be placed over asbestos - containing materials:

1. Six inches of compacted, non-asbestos-containing material/soil cover, with vegetation, or
2. two feet of compacted, non-asbestos-containing material/soil cover, to be maintained to prevent exposure of asbestos-containing materials to the atmosphere.

In addition, the requirements of the National Contingency Plan, 40 C.F.R. Part 300 (NCP), as adopted by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C.A § 9601 et. seq. (CERCLA) must be met. The requirements of the Superfund Amendments and Reauthorization Act of 1986, P.L. 99-499 (SARA) must also be followed, including § 121 cleanup standards.

#### 4.2 STATE

The State of Illinois has been delegated the authority to enforce the NESHAP regulations, including those listed above for asbestos. The only other State requirement applicable to this site, State of Illinois Environmental Protection Rules and Regulations, Part 807, Subpart C, Section 807.305, is relevant to ground water contamination and, therefore, is not mentioned further in this discussion of asbestos air emissions regulations.

#### 4.3 FREEZE/THAW EFFECTS

In locations where seasonal freezing occurs, such as the Waukegan area, stones and other large particles, such as broken scraps of asbestos, represent inclusions which tend to move differentially upward through the soil matrix with each freeze/thaw cycle. Thus, particles which are buried may move up to the surface by way of freeze/thaw effects. This phenomenon is well documented, and the appendix to this addendum provides a detailed explanation of freeze/thaw effects, factors effecting the extent of particle movement, and the calculations used to determine the appropriate cover thickness for remediation of airborne asbestos contamination from the dry disposal areas at the site.

In light of the fact that U.S. EPA contends that there is no acceptable concentration of carcinogenic substances, such as asbestos in air, an appropriate remedy must ensure that no asbestos is released to the atmosphere in the future. Due to this fact and the fact that freeze/thaw effects were not considered in writing the NESHAP requirements for asbestos, U.S. EPA feels that a cover thickness that appropriately addresses freeze/thaw effects must be applied to the Johns-Manville site to meet the remedial response objectives of CERCLA (i.e. to mitigate releases or threat of releases of contaminants which may present an imminent and substantial endangerment to public health and the environment) and the requirements of SARA. Manville agrees that freeze/thaw effects must be considered in selecting the appropriate cover thickness for the dry disposal areas.

## 5.0 U.S. EPA REQUIRED COVER THICKNESS

Considering all factors mentioned above and in the appendix, U.S. EPA requires a cover thickness of 24 inches of compacted, non-asbestos-containing material, with vegetation, to be placed over the dry disposal areas at the Johns-Manville site (refer to Figure 1). The State of Illinois concurs with this remedy. The composition of the 24-inch layer is illustrated in the soil profile in Figure 2.

The alternative is designed to ensure that the asbestos does not enter the covering layer more than 10 times per century. It is necessary to design the cover from this standpoint because, although exact rates of particle movement through the covering layer are not known, once asbestos enters the cover, it will eventually reach the surface and become releasable to the air.

U.S. EPA believes that this alternative meets all applicable Federal and State requirements, including the remedial response objectives of CERCLA, and provides sufficient long-term protection to public health and the environment. In addition, the cover thickness achieves the cleanup objectives of § 121 of SARA, which states a preference for permanent remedies.

### 5.1 Comparison to Manville Recommended Alternative

Manville and U.S. EPA basically agree on the soil cover thickness calculations. The disagreement centers on the cost-benefit analysis between providing an adequate level of protection to public health and the environment and the cost of said protection. Refer to Appendix C of the FS Report for data (provided by Manville's consultant) substantiating the following discussion.

Using a conservative approach, Manville's proposed 18-inch soil cover alternative allows, on the average, asbestos particles to reach the surface and become releasable to the air in approximately 80 years. This alternative costs \$4,086,090 (present worth).

The U.S. EPA required cover thickness of 24 inches is designed so that asbestos particles will not enter the covering layer more than 10 times per century, and, using a conservative approach, ensures that on the average, asbestos particles will not break the soil surface and become releasable to the air in approximately 500 years. This alternative costs \$4,487,590 (present worth).

U.S. EPA believes that the potential for failure (asbestos reaching the soil surface) of the 18-inch cover is not acceptable in light of the hazardous nature of asbestos, and that the additional health protection provided by the 24-inch cover, as indicated by the above discussions, clearly justifies the expenditure of the additional \$400,000. The figure of \$400,000 represents only a 10 percent increase in cost over that of the 18-inch alternative.

Si(Areas to Which Addendum Applies)

## SITE MAP

JOHNS-MANVILLE DISPOSAL AREA  
WAUKEGAN, ILLINOIS  
S94-3224

**Rumer Malheiro & Assoc., Inc. --- Grand Rapids, Michigan**

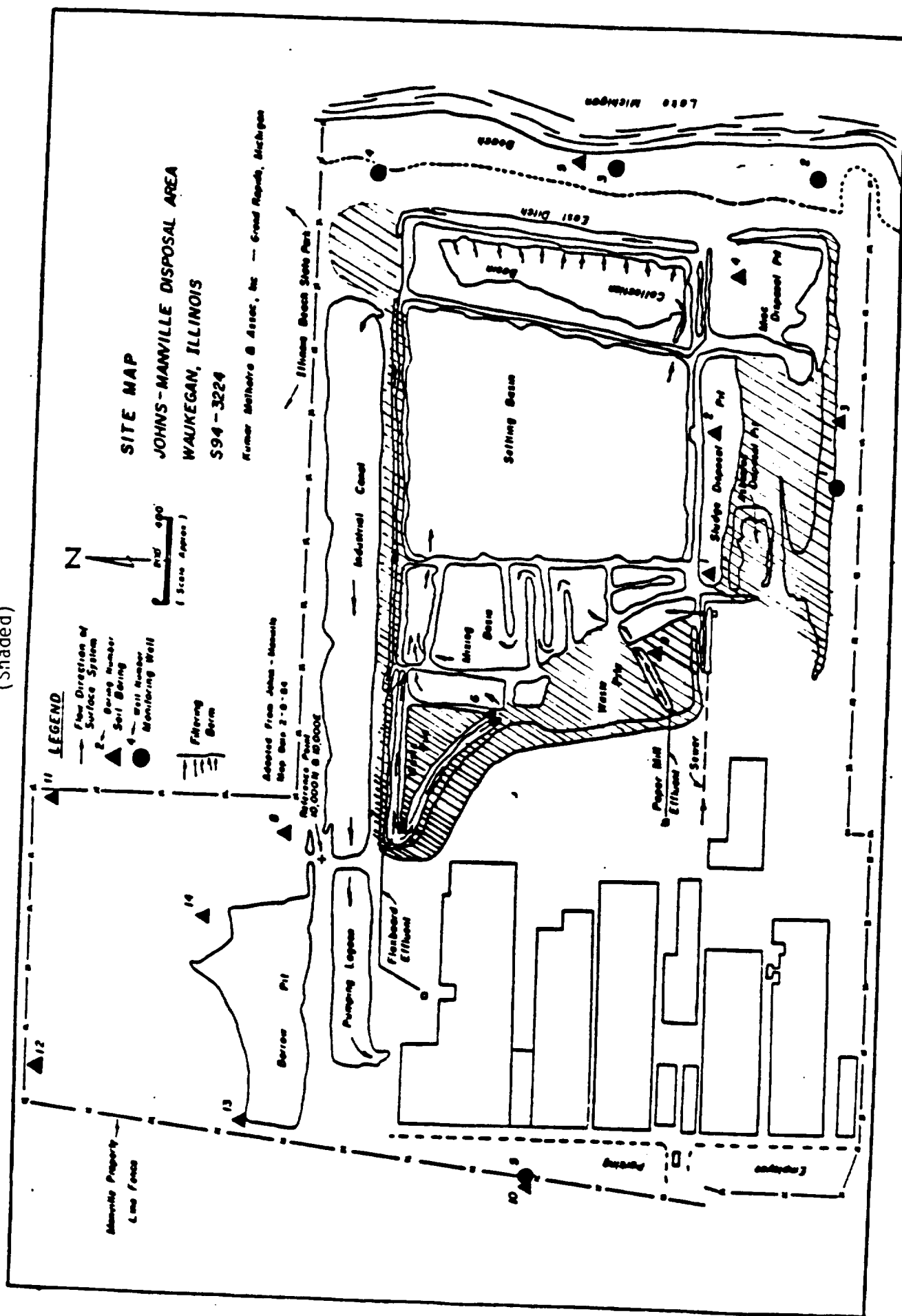




FIGURE 2  
Soil Profile For Required 24-inch Cover

